



Internet Connection Sharing in the Intel-Based Electronic Classroom

Application Note

May 2001

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Revision History

Date	Revision	Description
April 2001	001	Initial release of document

1.0 Document Objective and Usage

This document is intended to help system integrators implement Internet connection sharing in the Intel-based Electronic Classroom Environment.

Internet connection sharing is made possible by using Microsoft Windows* 98 Second Edition at the teacher station.

The user of this document should be familiar with the following:

- How to set up the Intel-based Electronic Classroom network environment
- How to set up the remote boot student computing stations

2.0 Recommended System Requirements

2.1 Server Configuration

2.1.1 Hardware

- Intel® Pentium® III processor at 700 MHz or above
- Intel T440BX or Intel L440GX+ Server Board
- Minimum 20-Gbyte SCSI or IDE hard disk drive
- Intel® PRO/100 S Advanced Management Adapter

2.1.2 Software

- Microsoft Windows 2000 server or Windows NT 4.0 server with Service Pack 4 or higher
- TCP/IP protocol
- IPX/SPX compatible protocol
- Microsoft DHCP service
- Intel Electronic Classroom Remote Boot Utility version 2.0

2.2 Teacher Station Configuration

2.2.1 Hardware

- Intel Pentium III processor at 700 MHz or above
- Intel 440BX AGPset, Intel 810E, Intel 815E or Intel 820 chipset-based motherboard
- 100 Mbps Ethernet Adapter
- Floppy Disk Drive

- Hard Disk Drive and CDROM
- 56K Modem or other modem

2.2.2 Software

- Microsoft Windows 98 Second Edition or Windows* Me
- TCP/IP protocol
- Software drivers for Ethernet adapter, modem and others

2.3 Student Computing Station Configuration

2.3.1 Hardware

- Intel Pentium III processor or Intel ®Celeron™ processor at 433 MHz or above
- Intel CA810A, CA810E or recommended third-party motherboards
 - Please contact your local Intel sales office for further information.
- PXE2.0 compliant system
- 100 Mbps Ethernet Adapter
- Floppy Disk Drive
- Hard Disk Drive and CDROM (for first installation)

2.3.2 Software

- Microsoft Windows 98 Second Edition
- TCP/IP protocol
- IPX/SPX compatible protocol
- PXE Boot ROM build 082

3.0 Internet Connection Sharing Overview

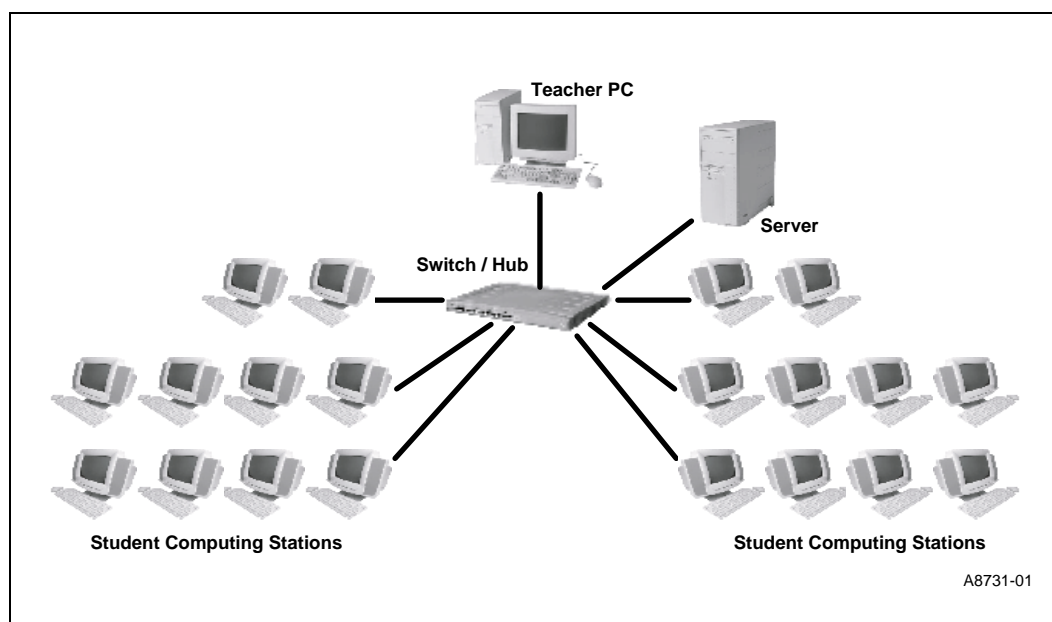
3.1 Introduction

Internet Connection Sharing (ICS) is a feature provided by Windows 98 Second Edition and Windows 2000. This feature enables various student computing stations connected in a Local Area Network (LAN) environment in a school network to share a single and simultaneous connection to the Internet by using a single phone-line and a modem connected to the teacher station, as shown in Figure 1.

For example, in the Intel-based Electronic Classroom, both teacher and students can simultaneously access the Internet where they can browse the Web, download files, and access e-mail.

3.2 How Internet Connection Sharing Works

Figure 1. Typical Intel-Based Electronic Classroom Configuration



Internet Connection Sharing is installed at the teacher station and is used to connect to the Internet. This teacher station is called an ICS host, or gateway. Student computing stations connected through the LAN will use the ICS host to connect to the Internet, and are therefore ICS clients.

When the ICS host dials to make an Internet connection, the Internet Service Provider (ISP) assigns the host an IP address. The ICS client stations share this IP address to gain access to the Internet. There is no need for each station to have its own IP address or have a direct connection to the Internet.

The Internet access request from the ICS clients is passed on to the ICS host through its Internet connection. This works the same when data is sent in the opposite direction from the Internet to the ICS client. When the host receives Internet data, it forwards the data to the ICS clients.

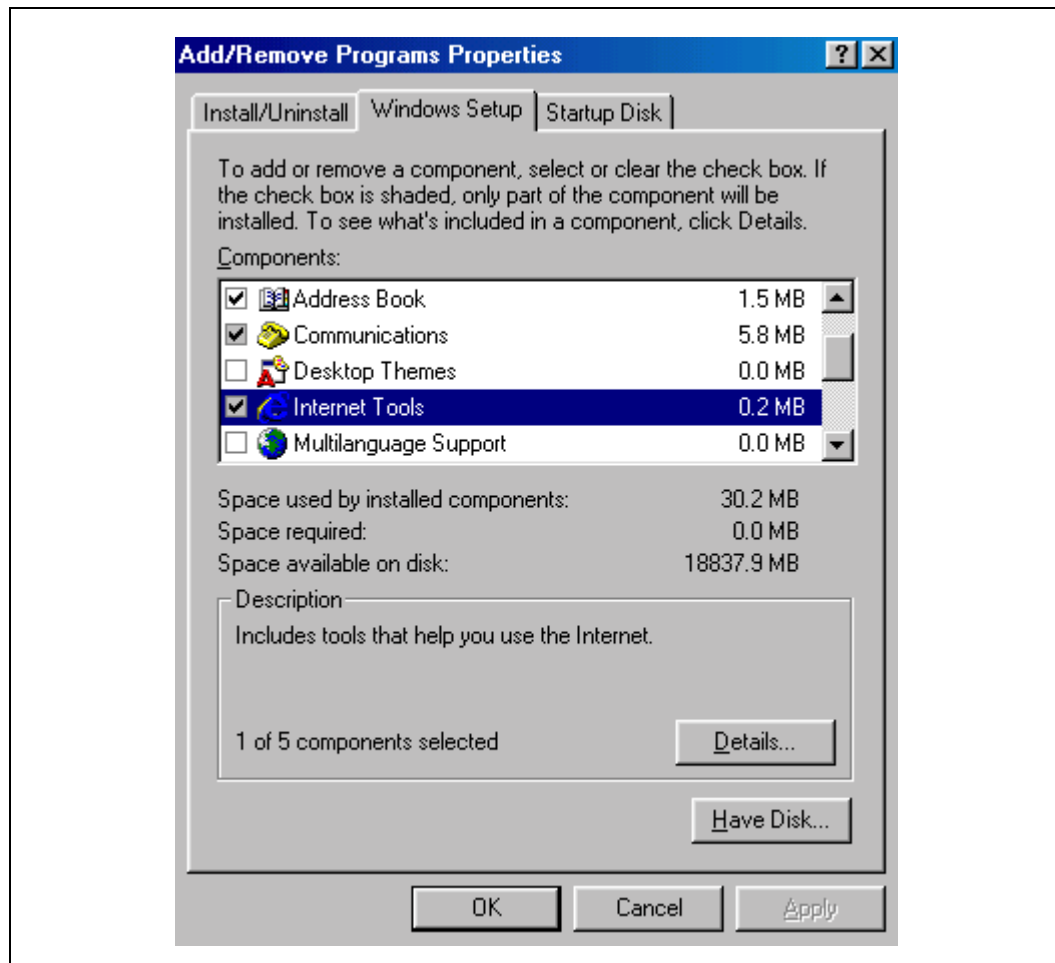
4.0 Internet Connection Sharing Installation – Teacher Station (ICS Host)

4.1 Teacher Station (ICS Host) Setup

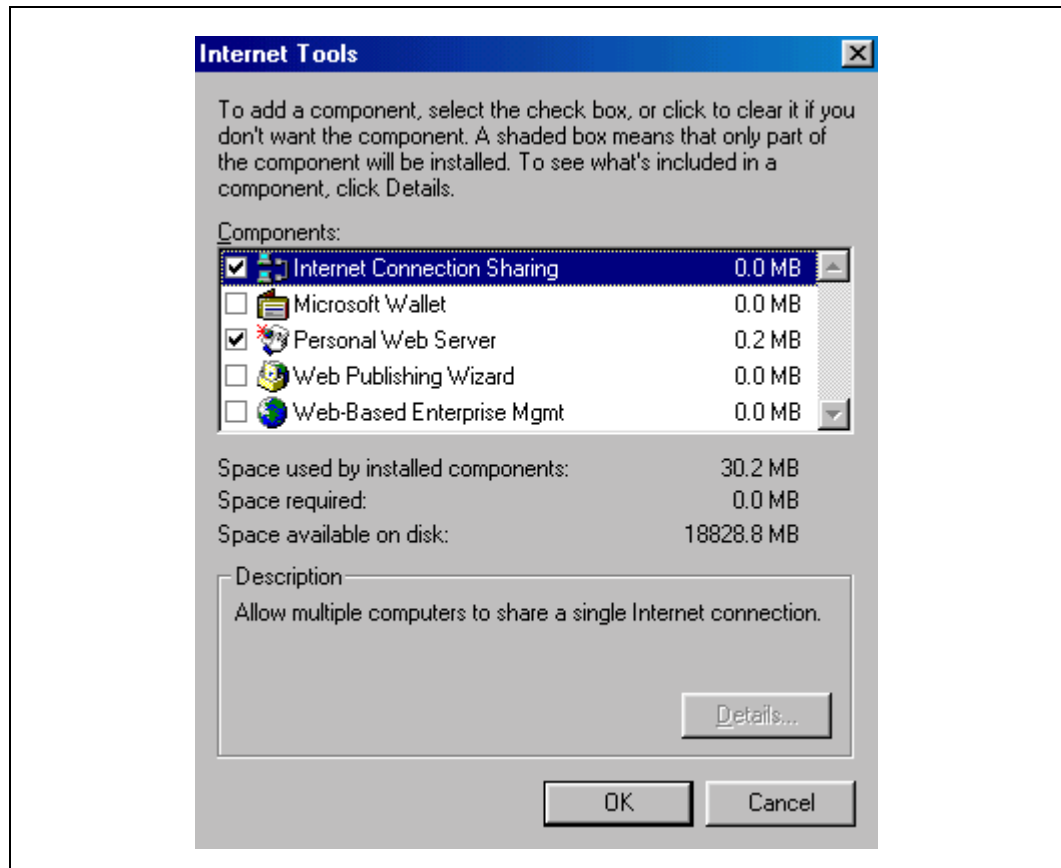
To enable the Internet Connection Sharing, follow the steps below.

1. Click on **Start** and choose **Settings**.
2. Choose **Control Panel**.
3. Double-click on **Add/Remove Programs**.
4. Choose the **Windows Setup** tab.

5. Make sure the box next to **Internet Tools** is checked, then click on **Details**.
(The default in Windows 98 automatically checks **Address Book** and **Communications**.
Leave these checked.)



6. Make sure the box next to **Internet Connection Sharing** is checked, and click **OK**.
(The default in Windows 98 automatically checks **Personal Web Server**. Leave this checked.)



7. Click **OK**.
8. Insert your Windows 98 Second Edition CD-ROM.
9. When prompted, click **OK** to allow Windows to copy the necessary files.

10. The Internet Connection Sharing Wizard will appear.

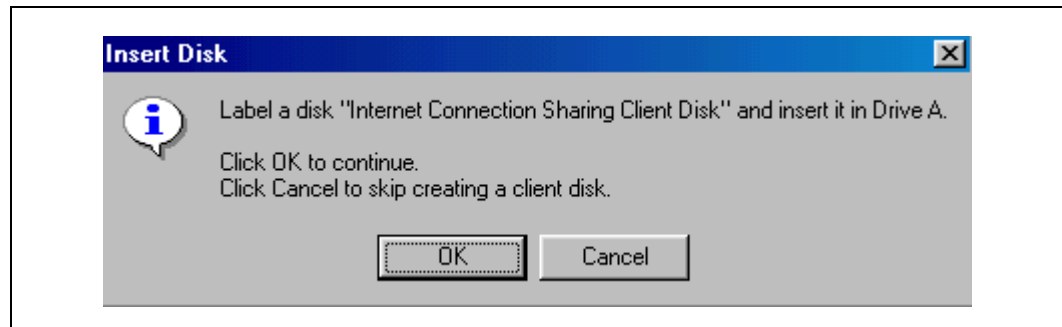


11. Click **Next** and the wizard will create a Client Configuration Disk.

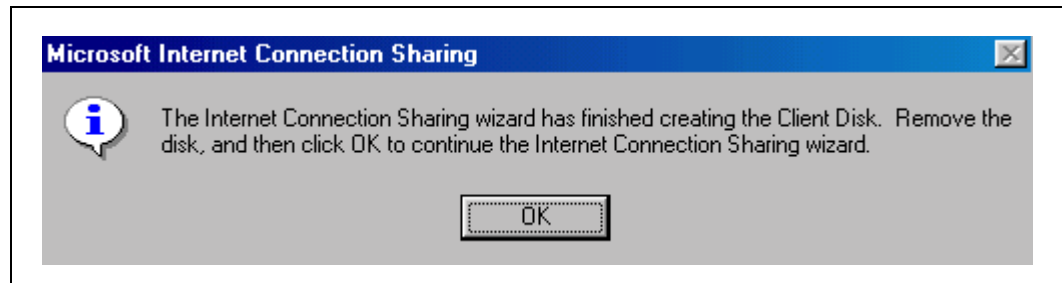
12. Click **Next**.



13. Insert a blank formatted 1.44-Mbyte floppy disk into the floppy drive. Click **OK** to create a client configuration disk.



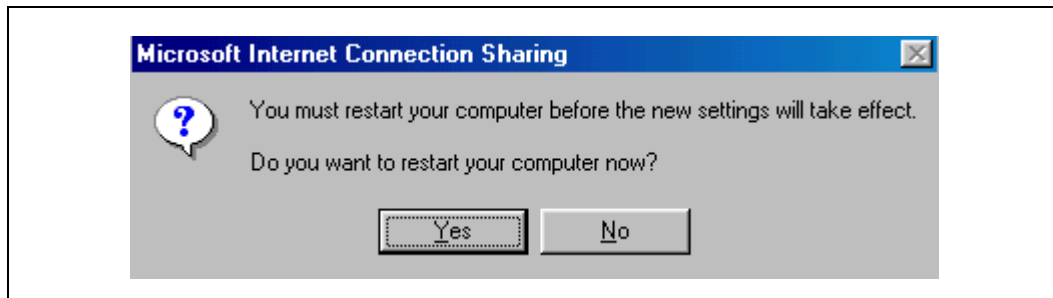
14. When the wizard is finished creating the disk, remove the disk and click **OK**.



15. Click **Finish** to complete the Internet Connection Sharing Wizard.



16. Click **Yes** for the computer to restart.



The Internet Connection Sharing setup is completed at the teacher station.

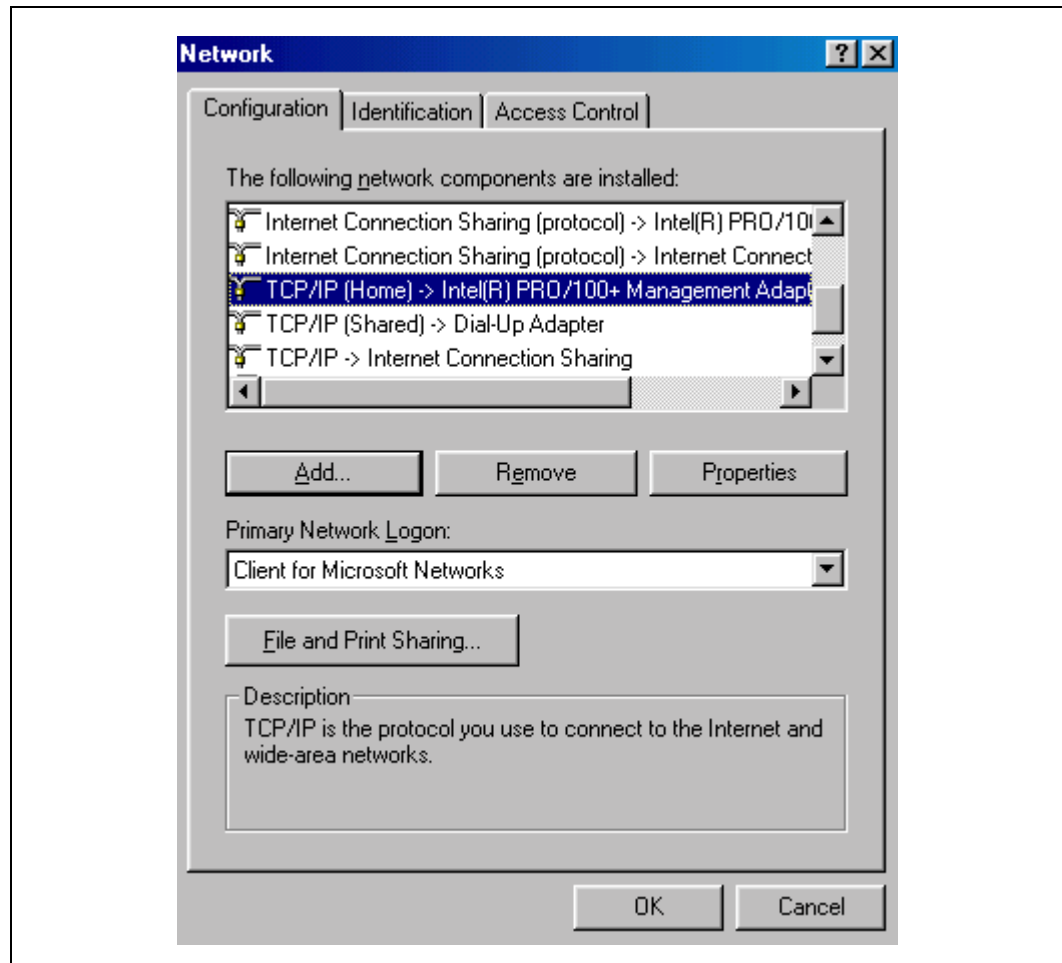
4.2 Teacher Station (ICS Host) Configuration

After the computer restarts, a network logon screen appears. You must log on by defining a user name and password for the Internet Connection Sharing to function.

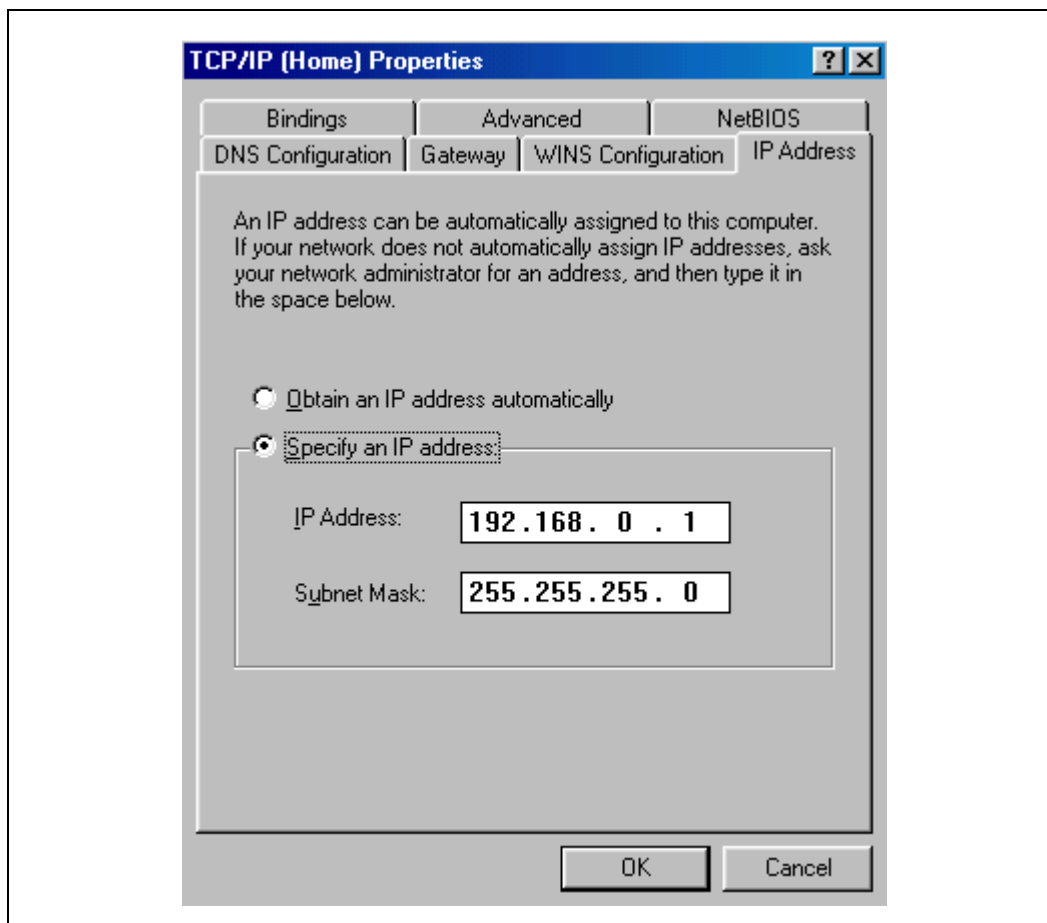
Follow the steps below to assign a static IP address for the host:

1. Click on **Start**, choose **Settings** and then **Control Panel**.
2. Double-click on the **Network** icon and select the **Configuration** tab.

3. Select **TCP/IP (Home) -> Intel® PRO/100 + Management Adapter**.

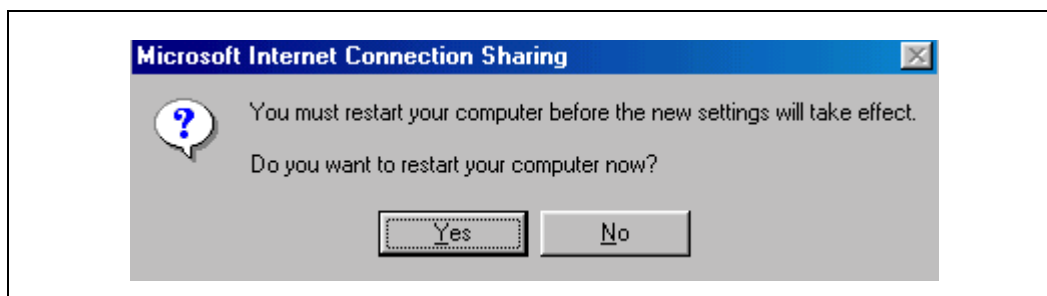


4. Click on **Properties** and select the **IP Address** tab.
5. Check on **Specify an IP address** by specifying an IP address and the Subnet Mask. For example,
IP Address: 192.168.0.1
Subnet Mask: 255.255.255.0



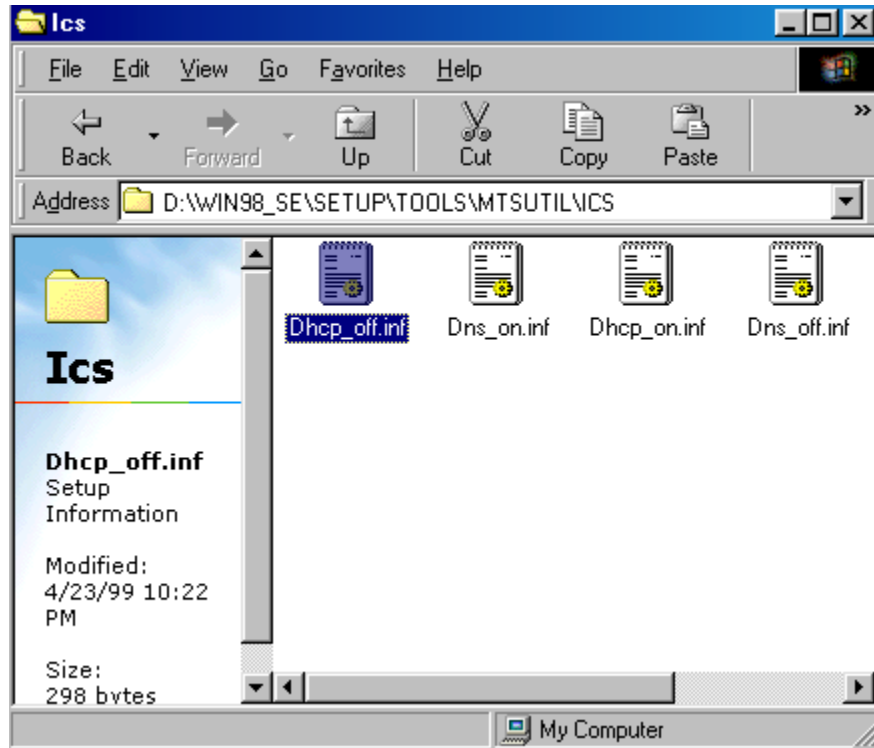
Note: You may use another IP address instead of the above default address. If you do so, you may need to change the settings by referring to the Internet Connection Sharing Advanced Configuration in Section 8.0.

6. Click **OK** and the computer will prompt you to restart. Click **Yes**.



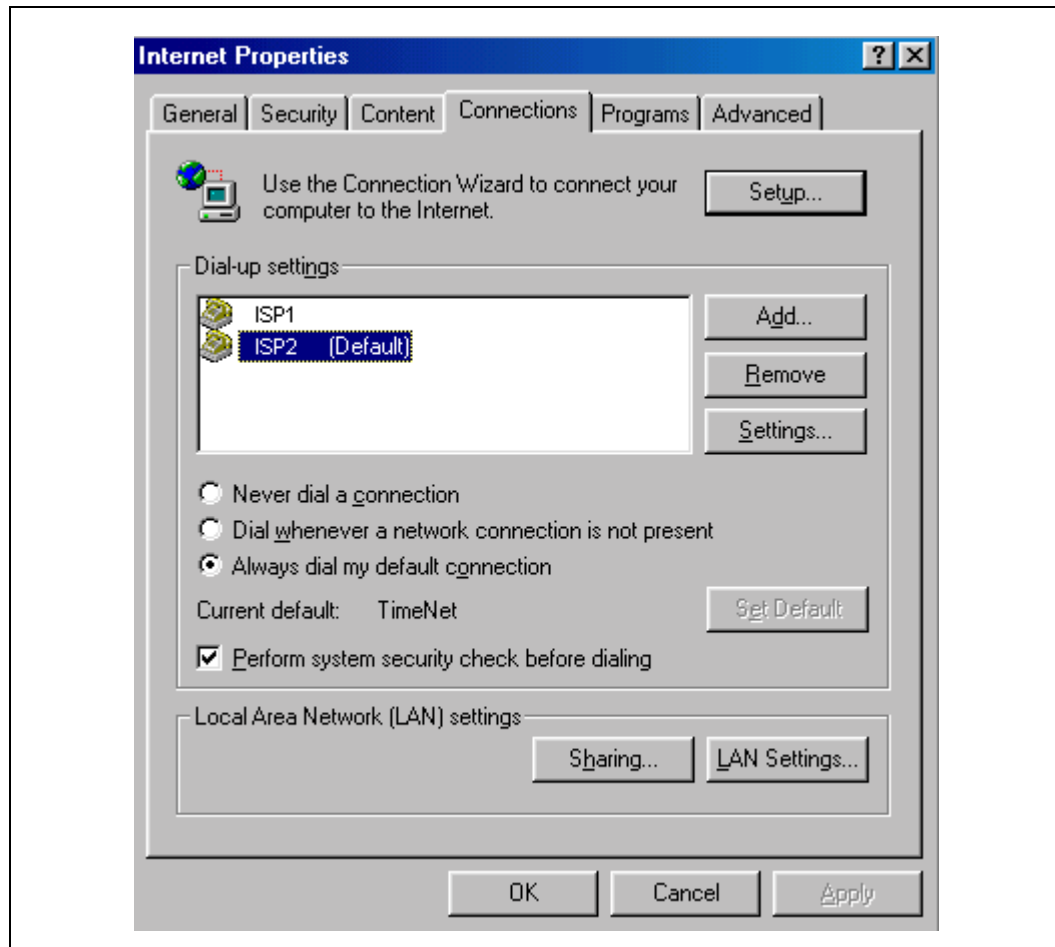
7. Since there is a Windows NT 4.0 or Windows 2000 DHCP server available at the electronic classroom network, the DHCP service must be disabled at the ICS host (teacher station) to avoid any conflict between them.

- a. At the teacher station, in the Windows 98 Second Edition CD-ROM directory, go to \Setup\Tools\Mtsutil\ICS folder.

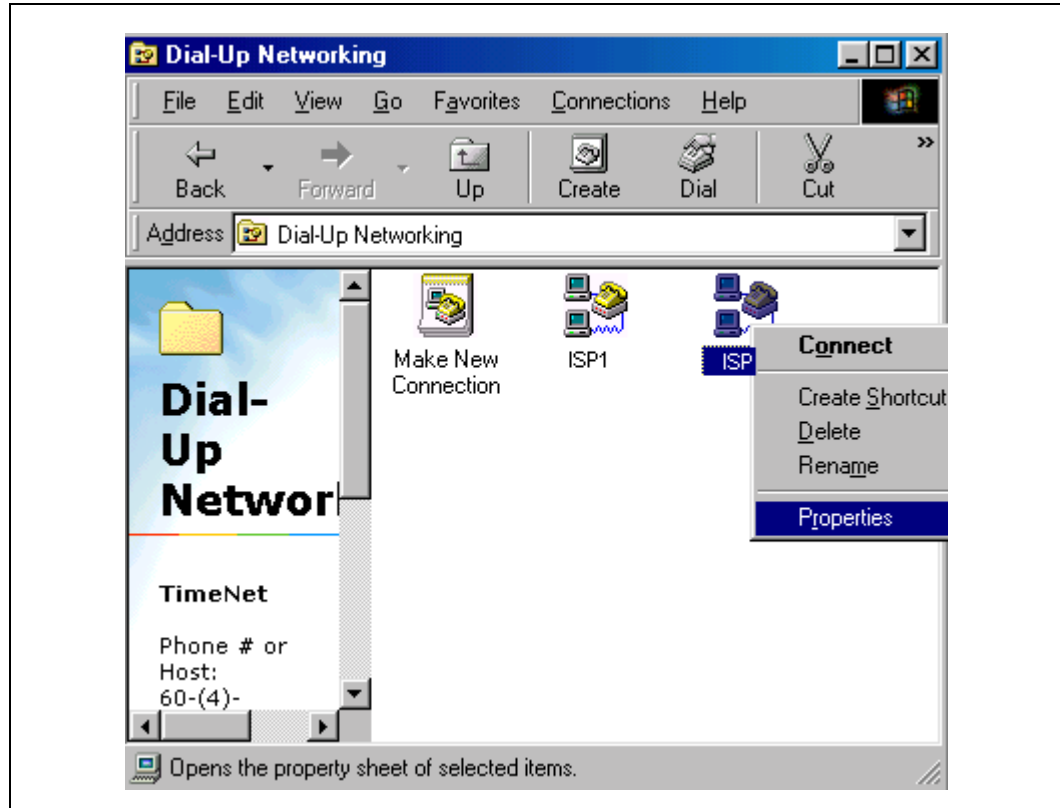


- b. Right-click on the **Dhcp_off.inf** file and select **Install**.
- c. When prompted, restart the computer again to activate the new setting.

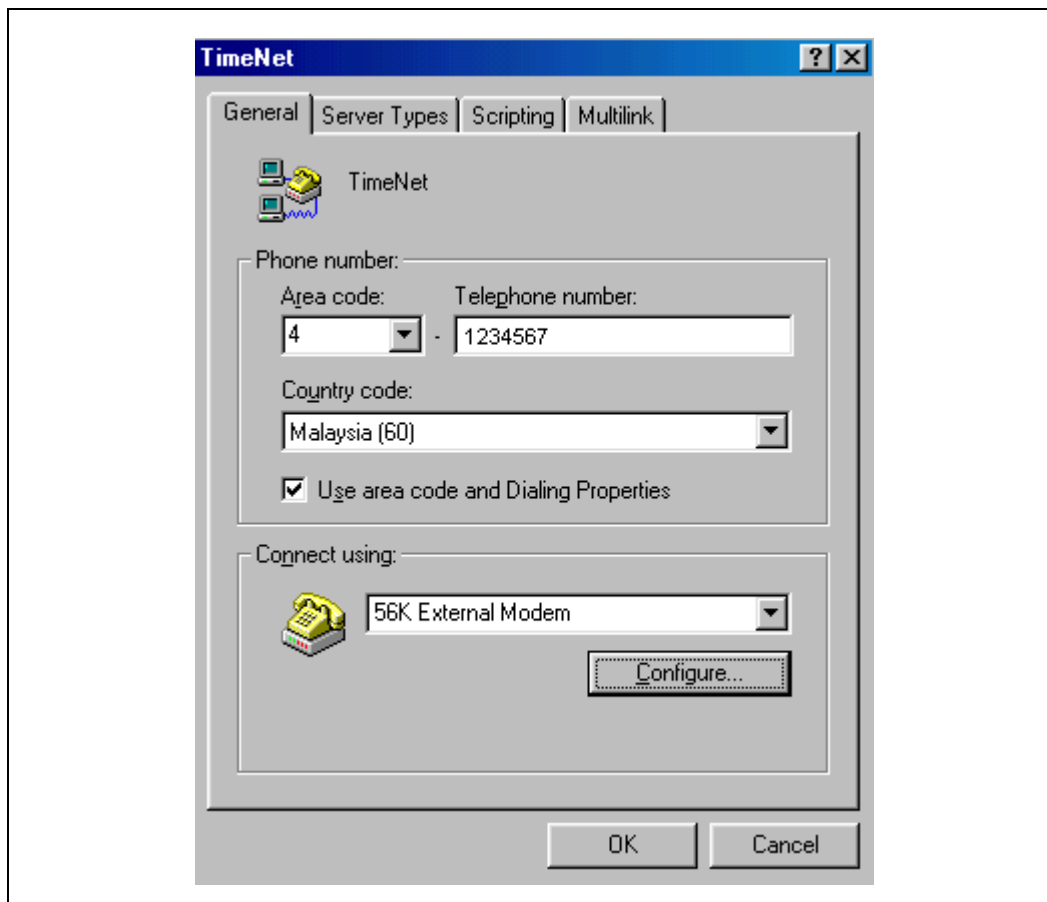
8. Set the correct Internet Options:
 - a. Click on **Start**, choose **Settings** and then **Control Panel**.
 - b. Double-click on the **Internet Options** icon.
 - c. Select the **Connections** tab and click on the default dial-up settings. For example, TimeNet.
9. Click on **Always dial my default connection** and **Perform security check before dialing** check box.



10. If you want to terminate the connection to the Internet when the modem is idle (not sending or receiving any data) for a specific time, follow the steps below:
 - a. Go to **My Computer** and double-click on **Dial-Up Networking**.
 - b. Right-click on the default dial-up networking and select **Properties**.



11. Select the **General** tab and choose **Configure**.



- Click on the **Connection** tab.
- Click on **Disconnect a call if idle for more than 30 minutes**.

Note: You may set your desired time to disconnect if idle.

- Click **OK** twice to close the window.

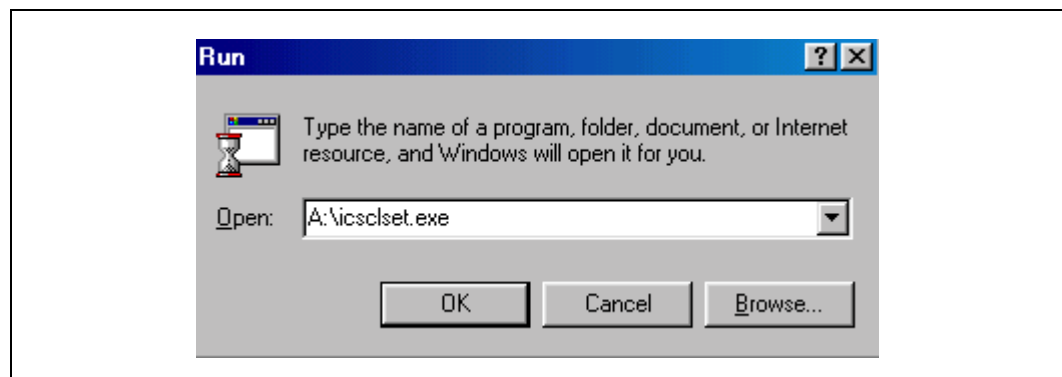
The teacher station is now configured to use the Internet Connection Sharing and you can proceed to the next step to install the Internet Connection Sharing on the Student Computing Stations.

5.0 Internet Connection Sharing Installation – Student Computing Station (ICS Client)

5.1 Student Computing Station (ICS Client) Setup

ICS setup at the student computing stations must be done at the hard disk drive before the installation of the remote boot software. Before running the ICS setup, make sure that the teacher station (ICS host) on the network is connected to the Internet.

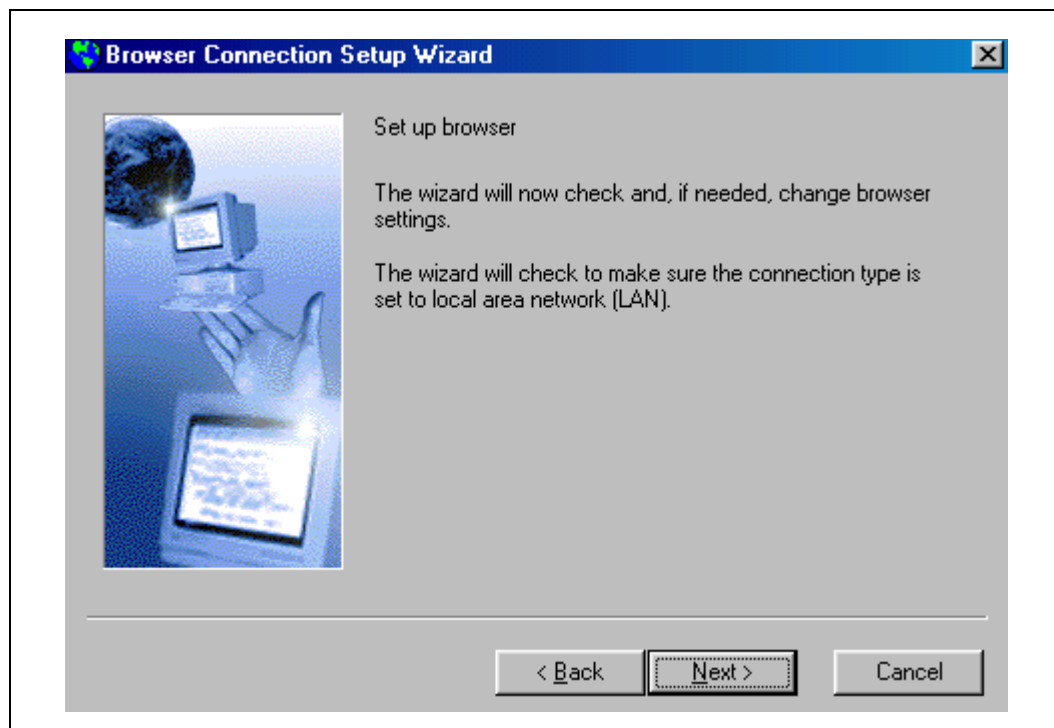
1. Insert the client configuration disk that you created with the Internet Connection Sharing Wizard into the student computing station.
2. Click on **Start** and choose **Run**.
3. Type **A:\icsclset.exe** and click **OK**.



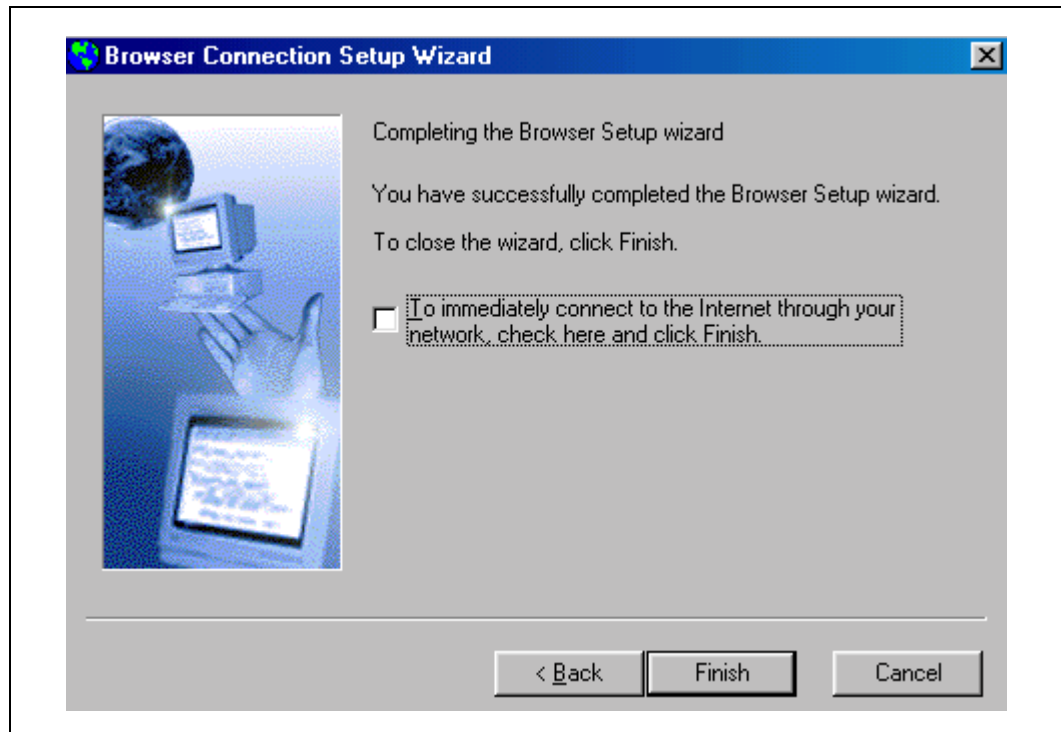
4. A Browser Connection Setup Wizard will appear. Click **Next**.



5. Click **Next** again for the wizard to run. Observe that the connection is set to local area network (LAN) and not a modem.



6. After the wizard finishes setup, click **Finish**. You may also check on the box if you wish to connect to the Internet immediately. Click **Finish**.

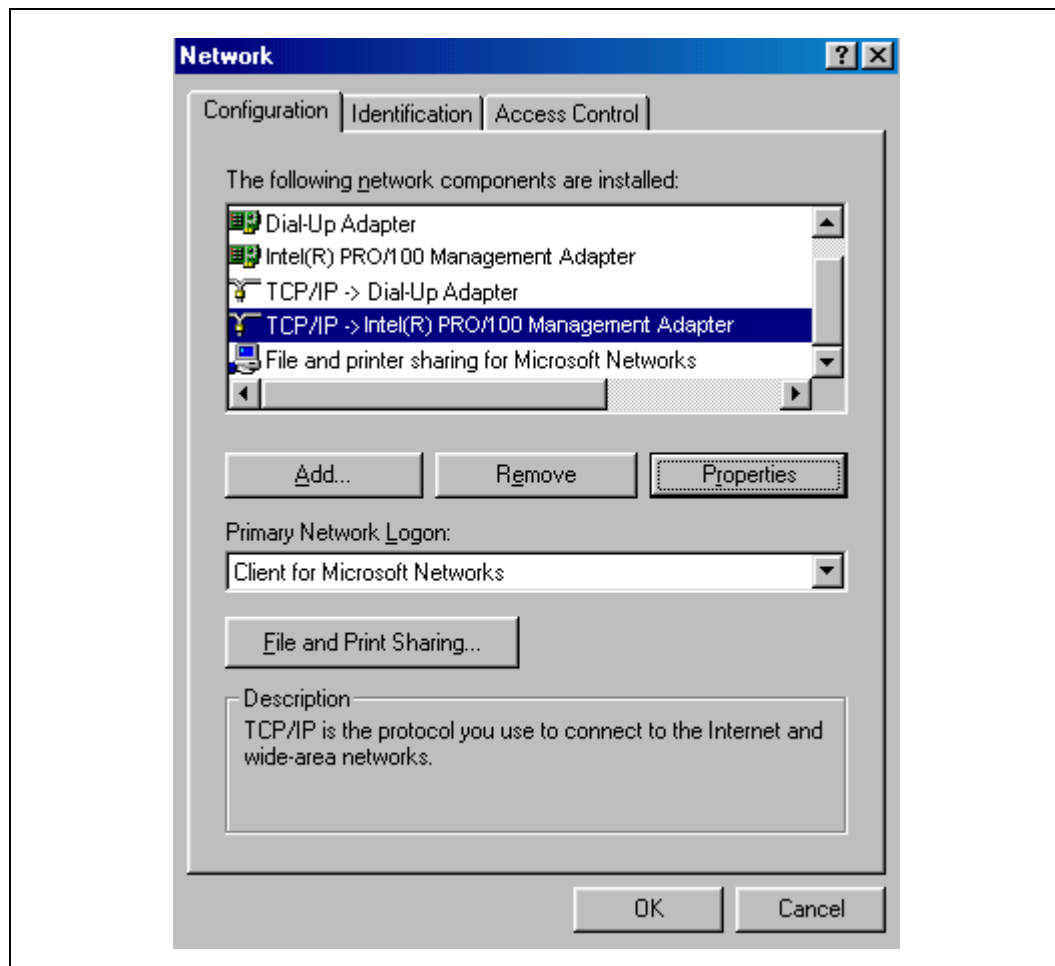


The student computing station is set up to use the Internet Connection Sharing by accessing the Internet through a Local Area Network (LAN).

5.2 Student Computing Station (ICS Client) Configuration

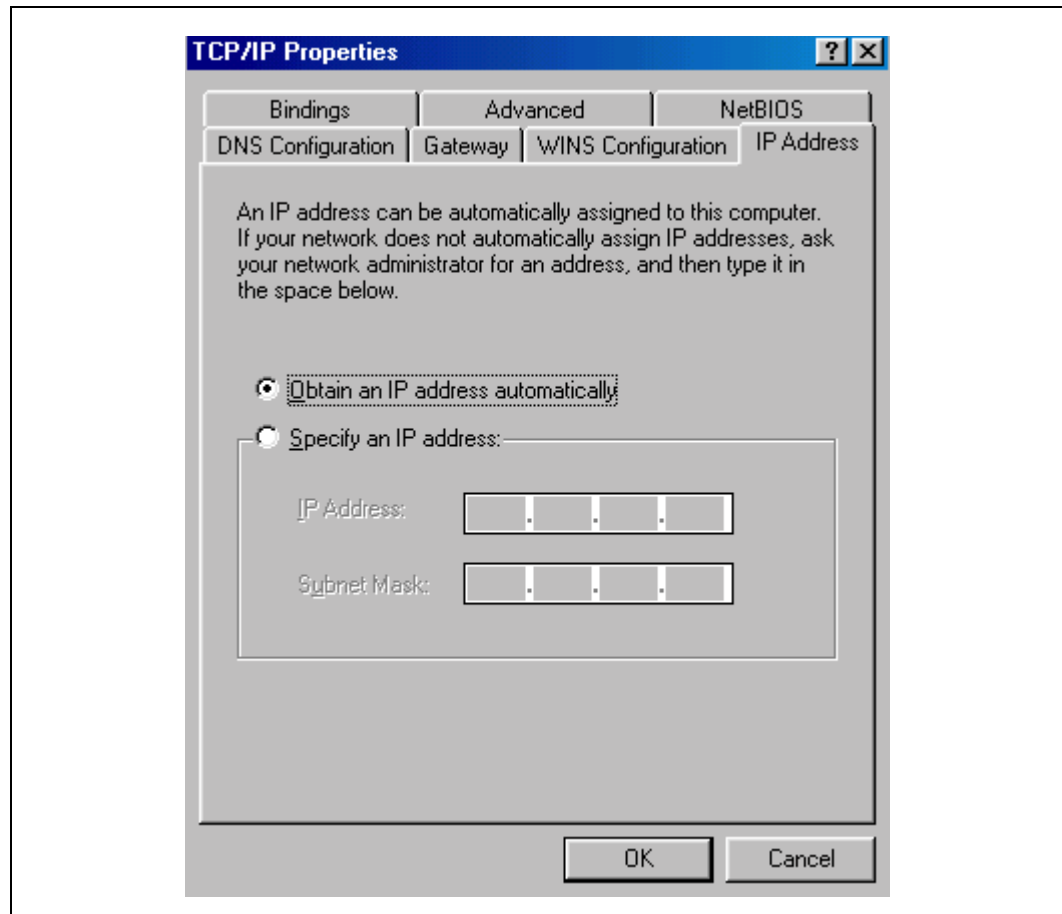
1. Click on **Start** and choose **Settings**.
2. Choose **Control Panel**.
3. Double-click on the **Network** icon.

4. Select the TCP/IP protocol in the network component list, which is **TCP/IP -> Intel(R) PRO/100 Management Adapter**.

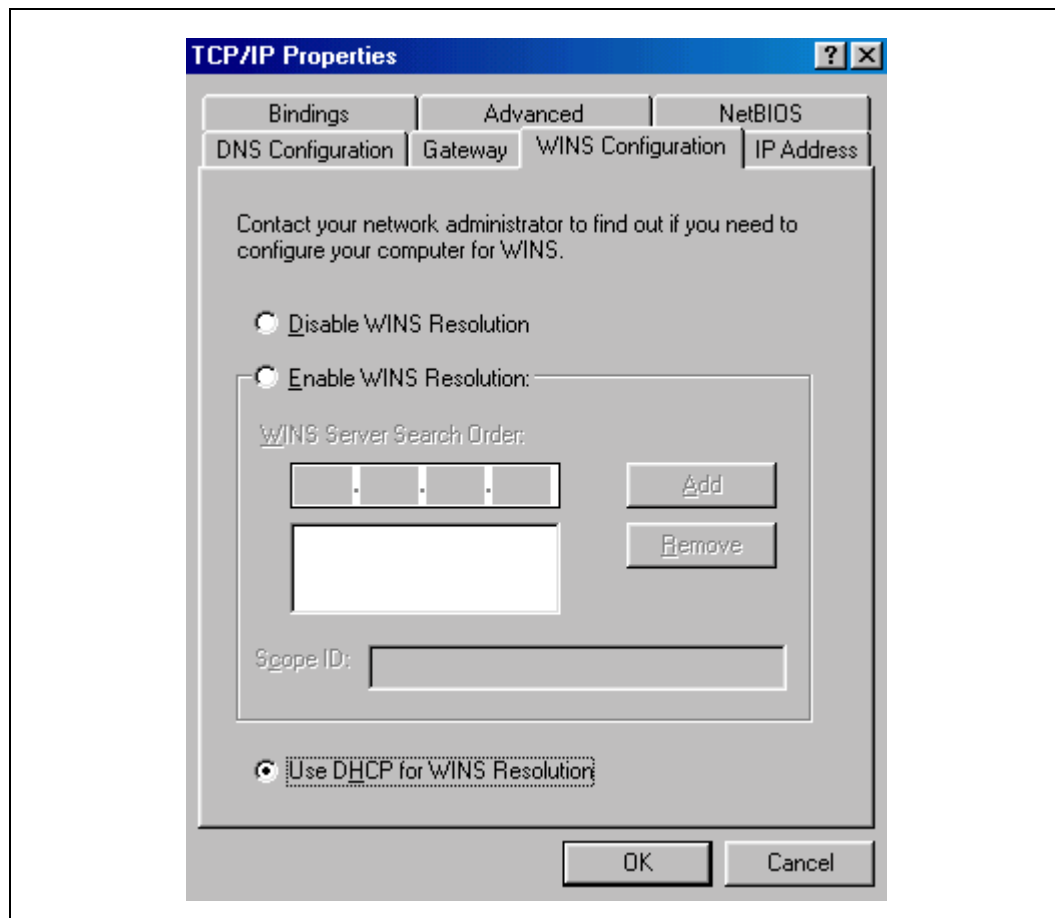


5. Click **Properties** and select the **IP Address** tab.

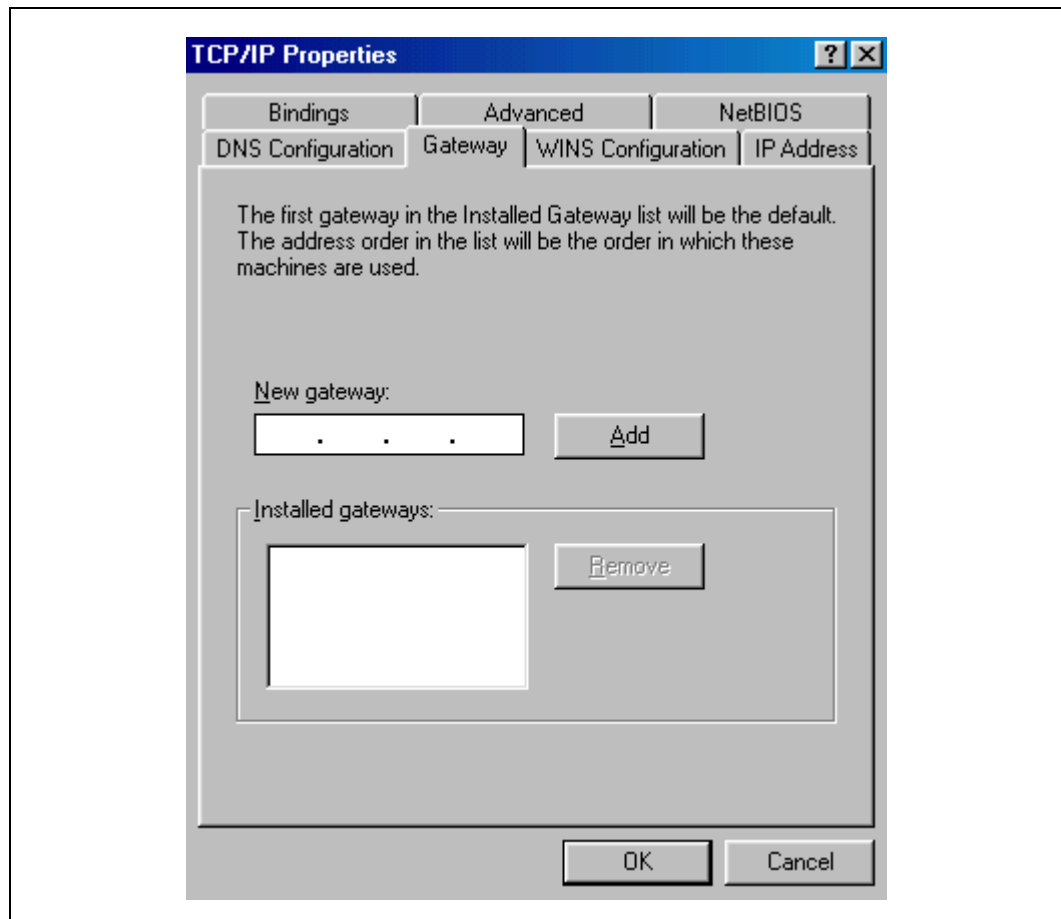
6. Choose **Obtain an IP address automatically**.



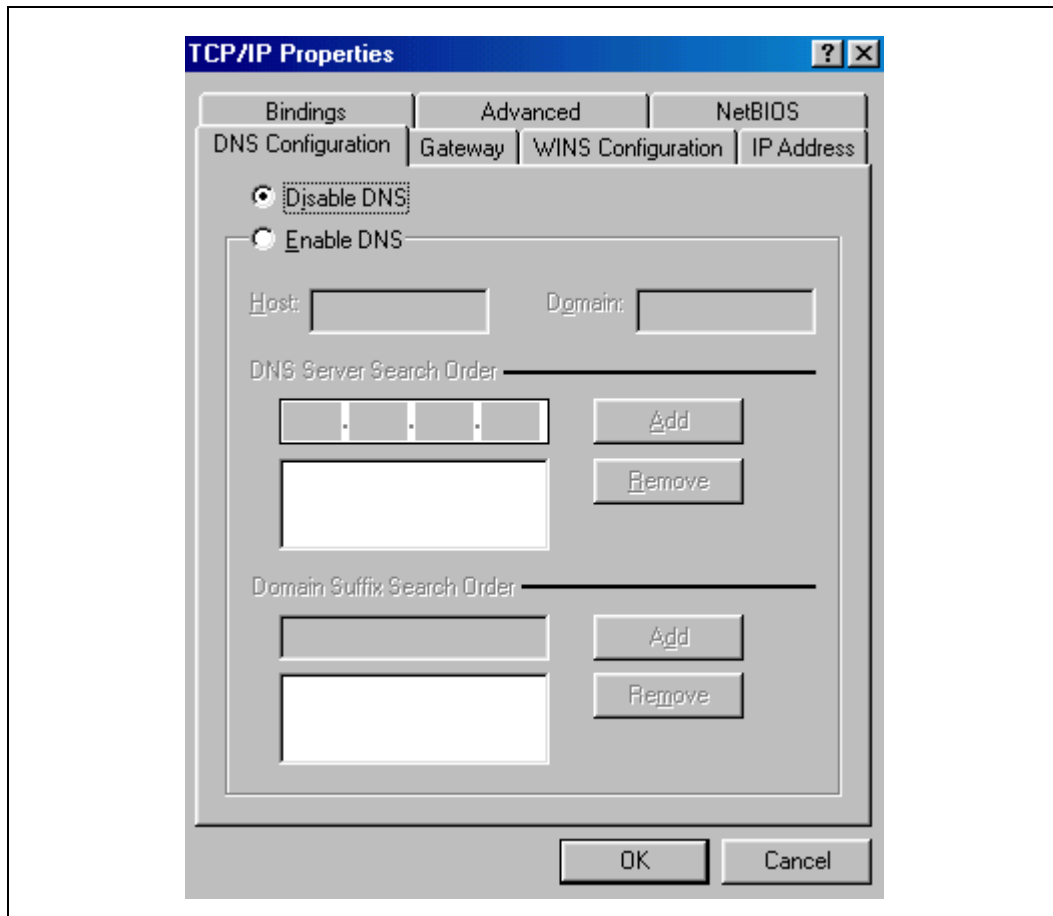
7. Select the **WINS Configuration** tab.
8. Click on the **Use DHCP for WINS Resolution** check box.
9. Click **OK**.



10. Select the **Gateway** tab and remove any installed gateways.
11. Click **OK**.



12. Go to the **DNS Configuration** tab and click on **Disable DNS**.



13. Click **OK** to accept the new TCP/IP Properties settings.

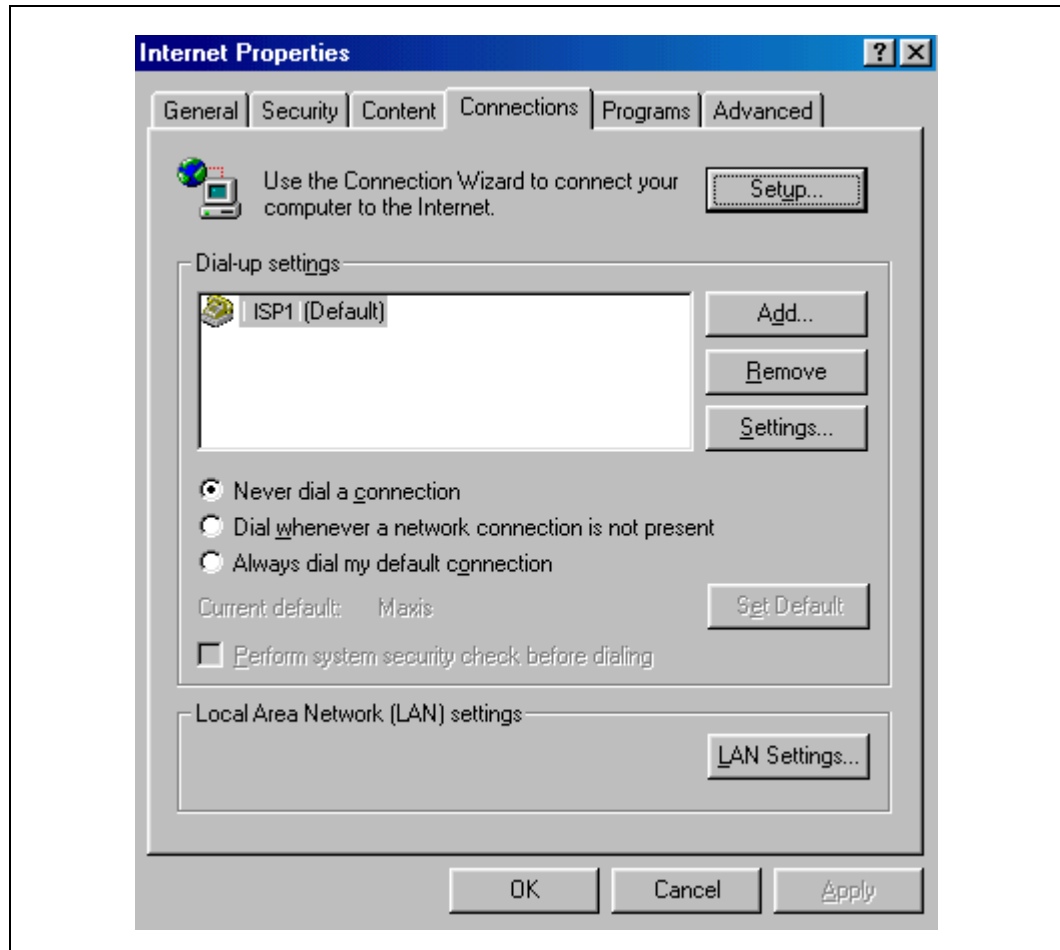
14. Click **OK** again to update the network configuration.

15. You will be prompted to restart the computer. Click **Yes** to restart.

After the computer restarts, the student computing station is configured for Internet Connection Sharing.

Set the Internet Options settings:

1. In **Control Panel**, double-click on the **Internet Tools** icon.
2. Go to the **Connections** tab.
3. Make sure **Never dial a connection** is checked.
4. Click **OK**.

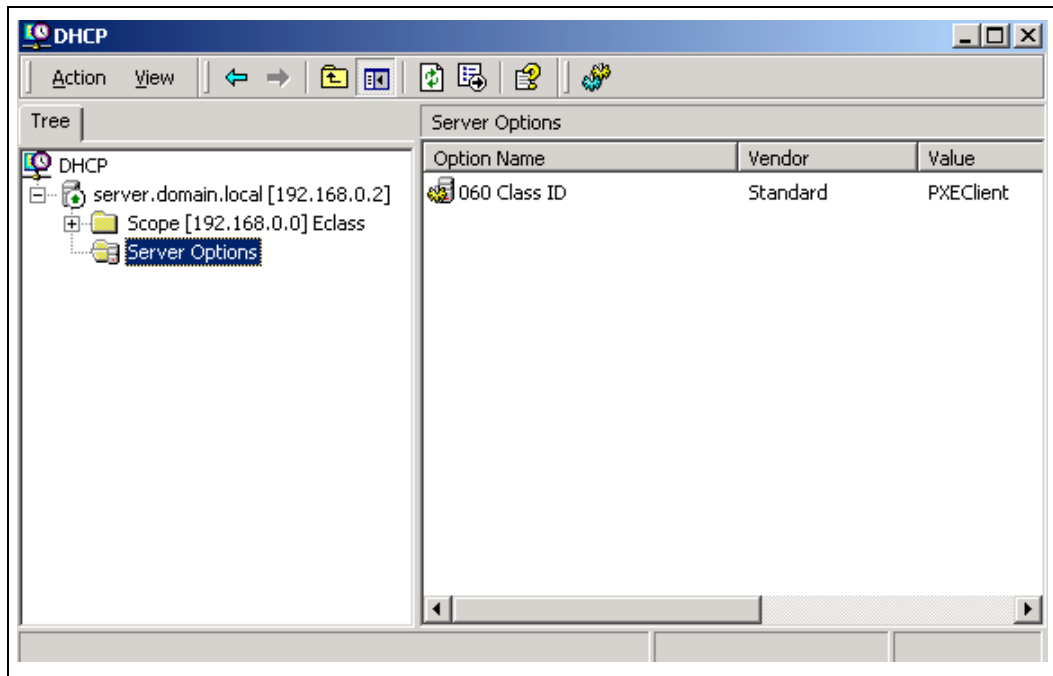


6.0 Internet Connection Sharing Installation – Server

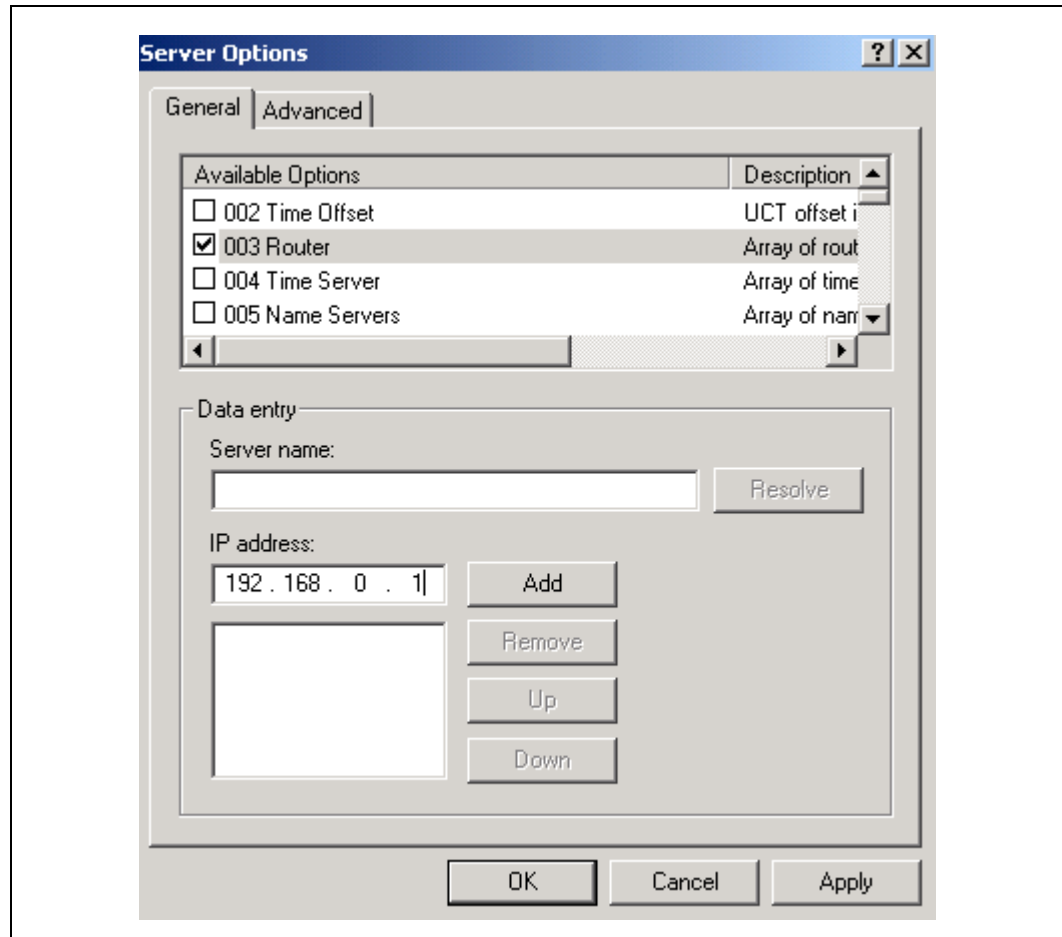
You should be able to set the IP address for the server and make sure that it does not conflict with the host and other clients. To do so, add the teacher station's IP address to the router and the Internet Service Provider DNS address in DNS server so clients can access the Internet.

Follow the steps described below:

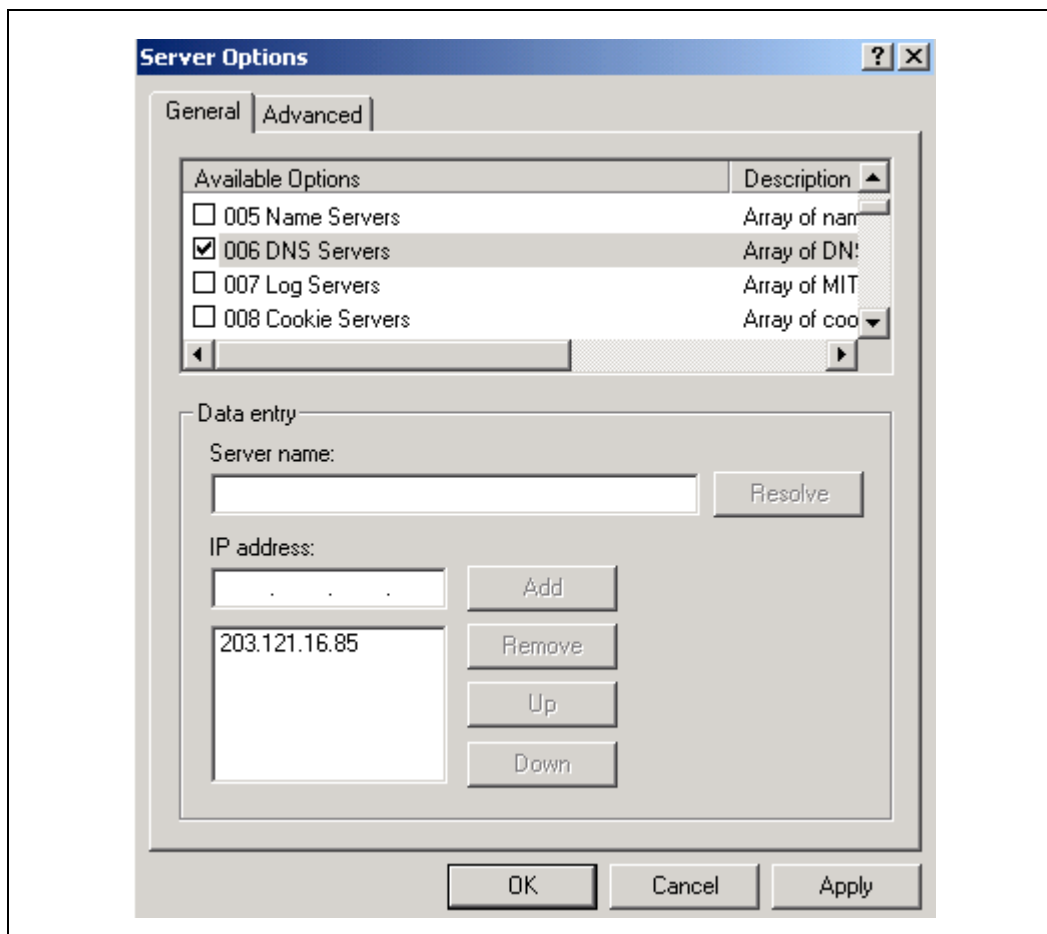
1. Click on **Start** and go to **Programs**.
2. Choose **Administrative Tools** and then **DHCP**.
3. Right-click on **Server options** and select **Configure options**.



4. Under the **General** tab, make sure **003 Router** is checked.
5. Add the **IP address** of the host and click **Add**. For example, the IP address shown here is 192.168.0.1.
6. Click **OK**.



7. Repeat steps 4 and 5 to add the Internet Service Provider DNS address for the **006 DNS server**. For example, the DNS address for the TimeNet Internet Service Provider shown here is 203.121.16.85.



Note: You may need to contact your Internet Service Provider for their DNS address.

8. Click **Apply** and then **OK**.

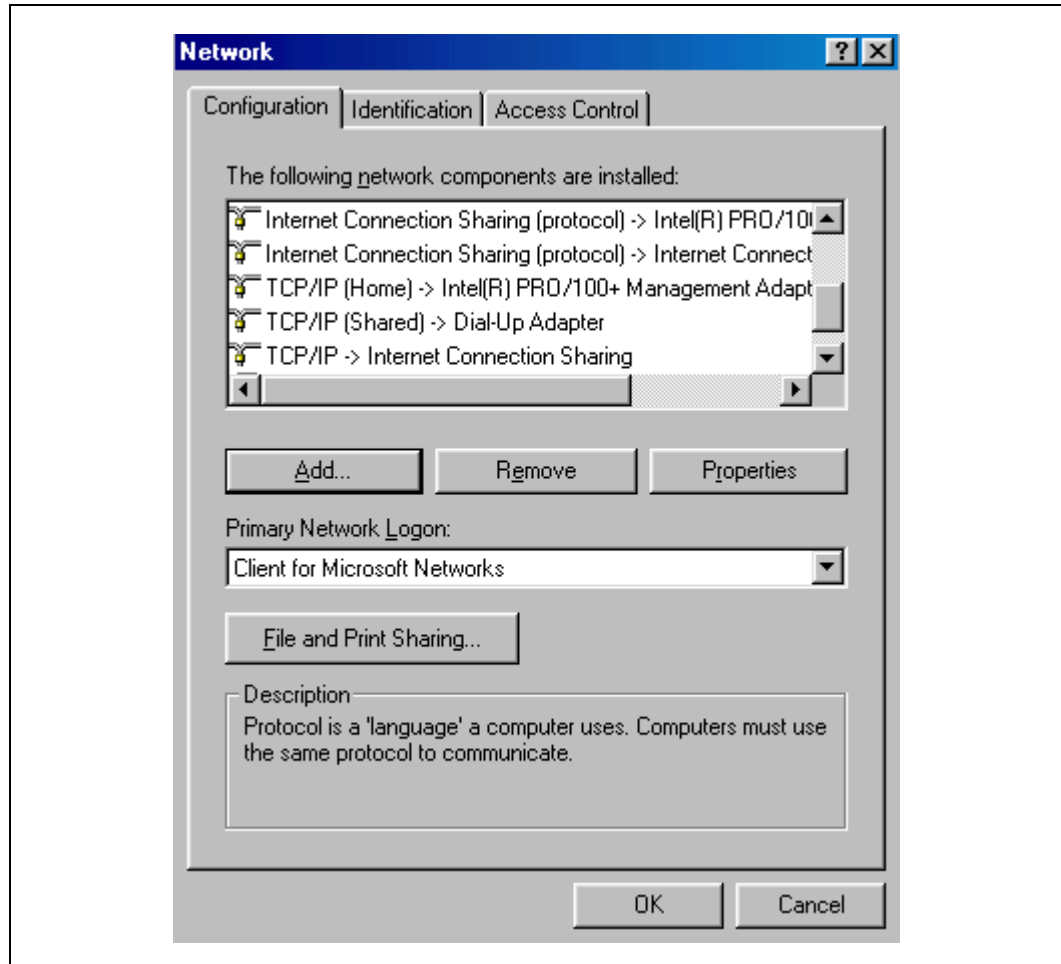
7.0 Internet Connection Sharing Checking

7.1 *Teacher Station Configuration Check*

To check whether the network components are installed at the teacher station, follow the steps below:

1. Click on **Start**, choose **Settings** and then **Control Panel**.
2. Double-click on the **Network** icon.
3. Click on the **Configuration** tab.

4. View the list in 'The following network components are installed' box to see if the following network components are installed. You should have:
 - TCP/IP (Home) -> Dial-up Adapter
 - TCP/IP (Shared) -> Intel® PRO/100 + Management Adapter
 - TCP/IP (shared) is the adapter used to connect to the Internet while TCP/IP (home) adapter is used to connect to the Local Area Network (LAN). If the components are not listed in the box, both the host and client computers cannot access the Internet and communicate with each other.

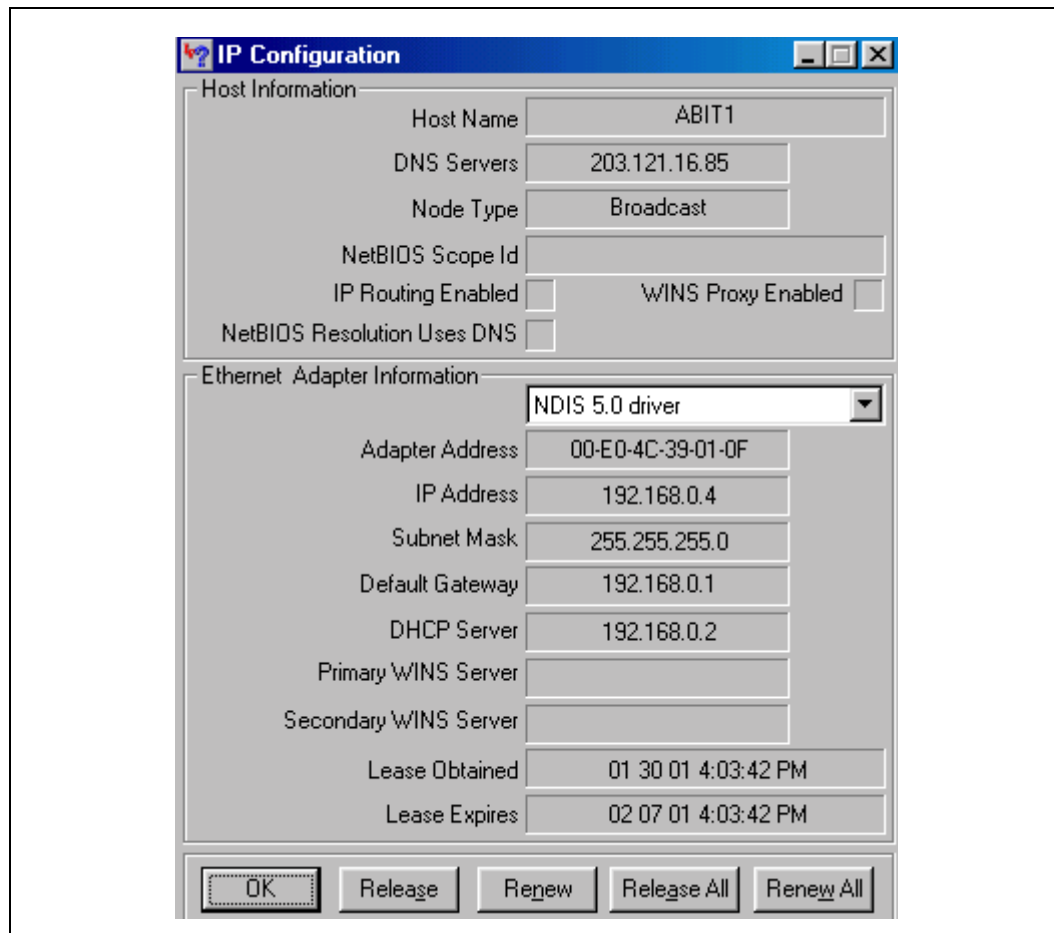


5. Click **OK**.

7.2 Student Computing Station Configuration Check

1. Click on **Start** and choose **Run**.
2. Type **winipcfg**.
3. Choose **NDIS 5.0 driver** and click on **More Info>>**.

The IP Configuration window should appear:



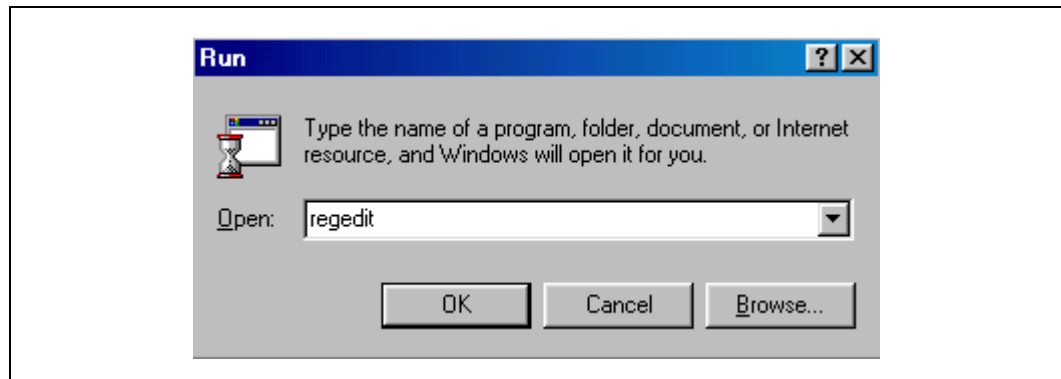
The default gateway of the client is obtained from the teacher station while the DNS Servers is from the Internet Service Provider. The DHCP server assigns an IP address to the client.

4. Click **OK**.

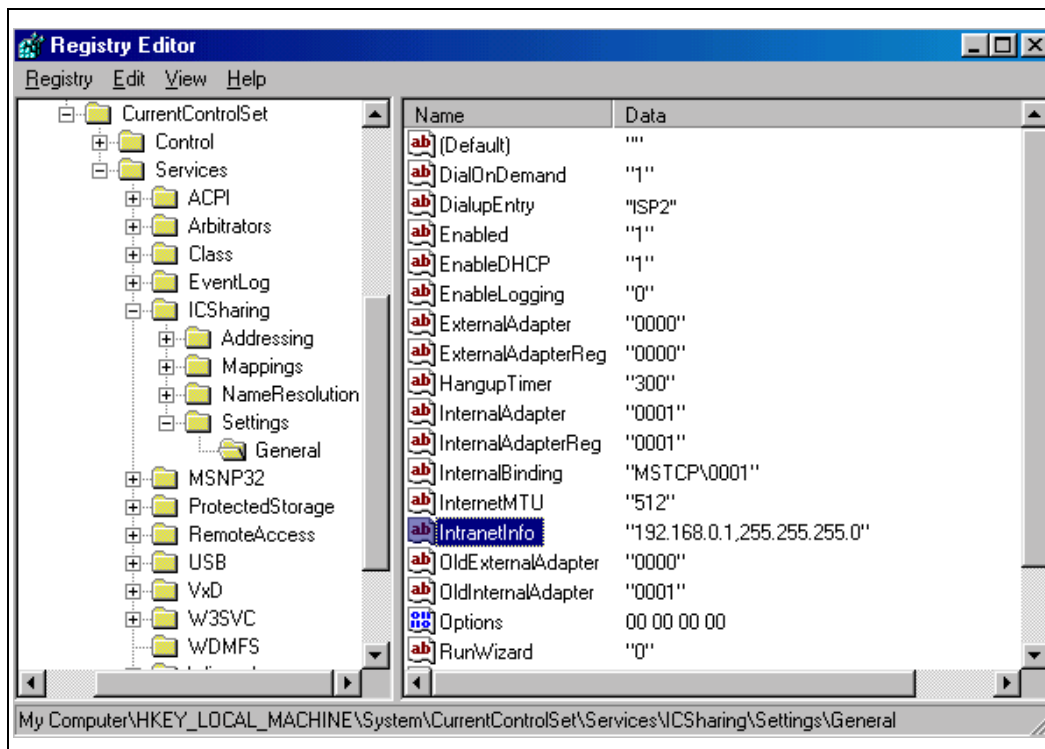
8.0 Internet Connection Sharing Advanced Configuration

Advanced configuration can be used for larger networks to define a range of IP addresses instead of a default IP address for the Internet Connection Sharing (ICS) host. This can be done directly by editing the registry as shown below:

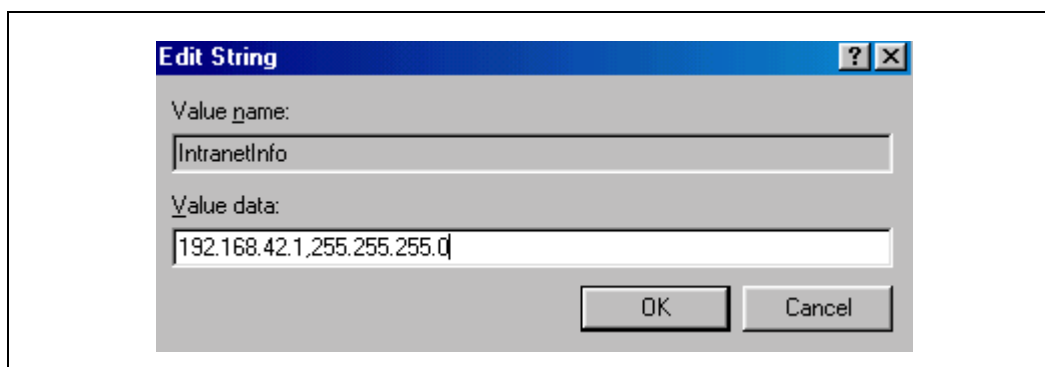
1. At the host, click on **Start** and go to **Run**.
2. Type **regedit**.



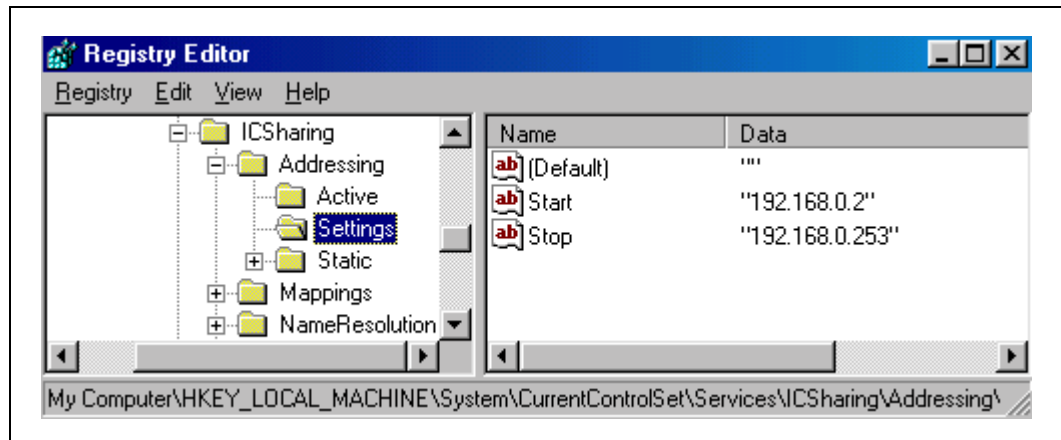
3. Select the **HKEY_LOCAL_MACHINE** folder.
4. Go to **System\CurrentControlSet\Services\ICSharing\Settings\General**.
5. Right-click on **IntranetInfo** and choose **Modify**.



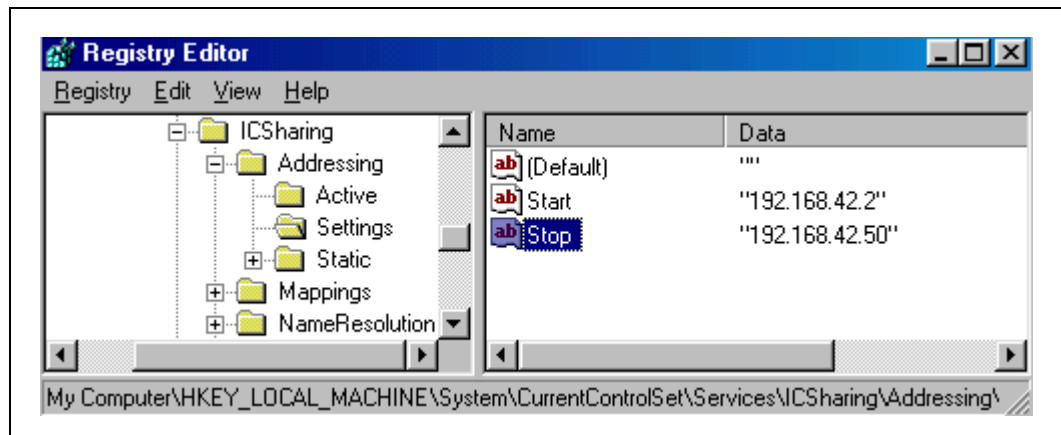
6. If you do not want to use the default IP address, you may change the IP address of the host to your desired address in the **Value data** box in the Edit String window. In this example, the address is 192.168.42.1.



7. If necessary, change the range of the IP address from the **ICSharing\Addressing\Settings** folder.



8. Modify the **Start** and **Stop** IP address. For this example, the range for 50 clients will be defined where the starting IP address is 192.168.42.2 and the ending address is 192.168.42.50.

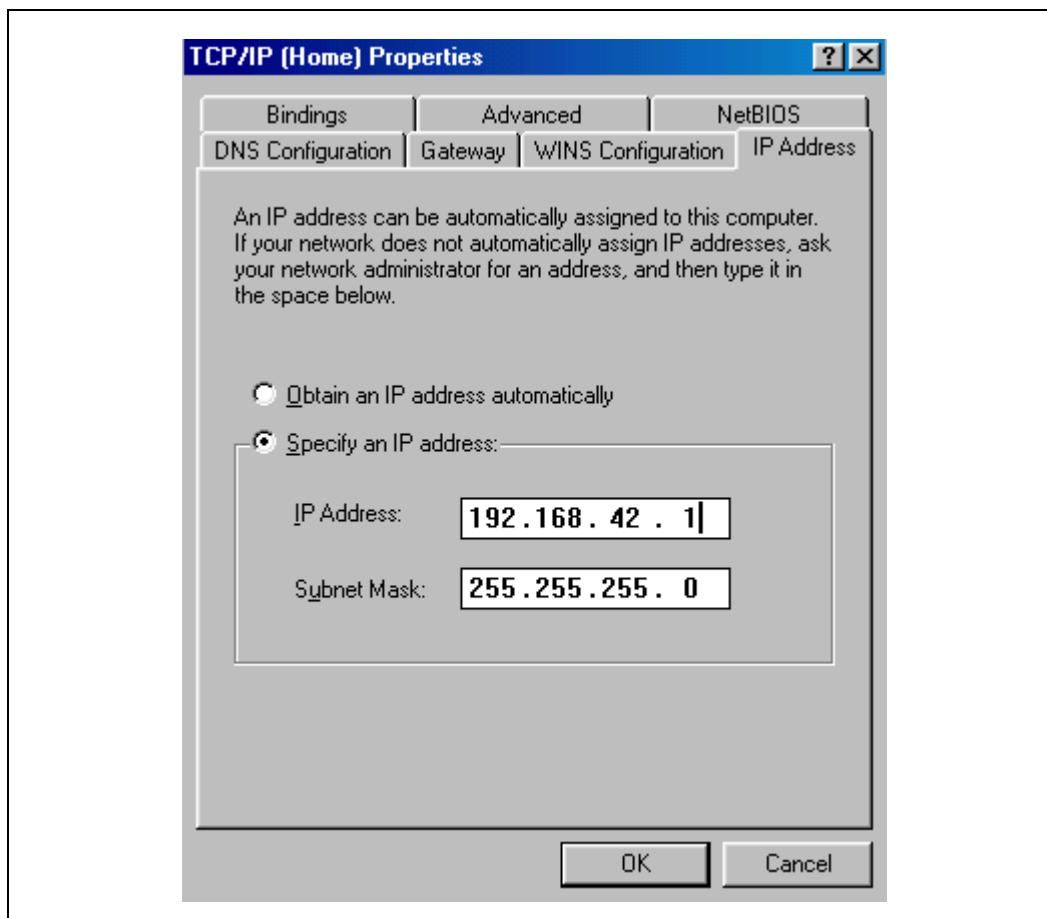


Note: This is only needed when there is no DHCP at the server. If DHCP_off is installed at the teacher station, the data here has no effect.

The IP address in the network configuration will have to be changed as well. Follow the steps below:

1. Click on **Start**, choose **Settings** and then **Control Panel**.
2. Double-click on the **Network** icon and select the **Configuration** tab.
3. Select **TCP/IP (Home)** -> **Intel(R) PRO/100 + Management Adapter**.

4. Click on **Properties** and select the **IP Address** tab.
5. Modify the IP address in **Specify an IP address** column.



6. Click **OK** and the computer will prompt you to restart. Click **OK** again.

After changing the IP address and range of IP address of the server, you may run **winipcfg** to check the IP address for both the server and client.

You may run the Internet Connection Sharing setup on other clients by repeating the steps in Section 5.0, "Internet Connection Sharing Installation – Student Computing Station (ICS Client)" on page 19.

9.0 Related Information and Web Sites

Table 1 provides the Web site locations of additional information regarding the Internet Connection Sharing.

Table 1. Web Site Locations for Additional Information

Web Site Description	URL Location
Intel	http://www.intel.com
Microsoft	http://www.microsoft.com
Internet Connection Sharing	http:// www.microsoft.com / HOMENET / ics.htm
How to Troubleshoot Internet Connection Sharing Problems	http://support.microsoft.com/support/kb/articles/Q238/1/35.asp
Description of How ICS Appears in Network Properties	http://support.microsoft.com/support/kb/articles/Q236/4/65.asp